Overview of Laboratory Network Activities

Current National Laboratory and Industry Testing in US

Testing Gaps and Needs

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Lab Network Activities

- Surveying current testing activities, capabilities and plans
- Categorizing testing and creating a testing matrix
- Identified needed tests
- Compared needed tests with matrix
- Listed Gaps

Examples on non-National Laboratory testing facilities

Testing Matrix

- Spreadsheet listing Organization, Sponsor(s) and Partner(s), Description, Status, Equipment, and Contact
- Divided into currently testing and future planned
- Categorized by
  - Operational Status
  - DR equipment
  - Size Capability
  - Types of Testing

Summary of US Test Capability Matrix

- Number of operational test sites
  - Associated w/DOE
  - Planned
  - National Laboratories
  - Universities
  - >50 utility “familiarity tests”
- DR Equipment
  - Fuel Cells
  - Micro/Advanced turbines
  - Control systems
  - Storage
  - Diesel/Natural Gas
  - PV
- Size Ranges kW - ~ MW
- Types of Testing
  - Interconnection
  - Communication & Control
  - Product Development, R&D

Typical Page of Test Matrix

Organization	Test Title	Sponsor/Partner	Description/Purpose	Test Schedule	Equipment	Contact
EPRI – PEAC	Tailored Collaboration (TC) Project for Distributed Generation	Various utilities and others	The immediate interests are in DR interconnect research focusing on multi and single unit DR interaction with existing Area and Local Electric Power Systems (Area EPS or APS).The project will begin by focusing on specific issues from three of the five TC tasks. Dynamic interactions – multiple interconnected DR units. System compatibility – the effects of DR on the power system and the effects of the power system variations on DR; single DR units and multiple interconnected DR units. Analysis of islanding protection – single DR units and multiple interconnected DR units.	System Compatibility Tests 2001 Dynamic and islanding tests 2002	Capstone Microturbine Fuel Cell	Tom Key EPRI PEAC
ORNL	DER/BCHP Integration and Testing	DOE Distributed Power Program	Activity 1 – DER/BCHP System Performance Activity 2 – DER Environmental Performance Activity 3 – Integration of DER and Fast Storage Technologies Activity 4 – DER Ancillary Services	The DER/BCHP testing will be conducted over multiple years. The DER/BCHP testing of a Capstone 30-kW microturbine is expected to be completed in 2001.	Capstone 30-kW Microturbine Unifin MicroGen Heat Exchanger **Englehard/ICC indirect-fired Desiccant Unit** Munters direct-fired Dessicant Unit Yazaki Absorption-Chiller Thermal Loops in Building Climate Simulators	Tom Rizy 865-574-5203 rizydt@ornl.gov
MIT Energy Laboratory	Models and software for transaction management, power flow control, and market models.	ABB, EdF, USDOE and others.	Can we aggregate and remotely operate and control DER to better respond to market signals?	On going.	Unknown	Dr. M. Ilic 617-253-4682
U of Wisconsin	Pricing, impact, penetration, power quality.	Undetermined	Do we understand the impact of DER on the grid? Where is it to be placed to maximize benefits?	On going.	Studies at this point.	F. Alvarado G. Venkataramanan
GE Zenith and Gas Technology Institute	Advanced interconnect, control and monitoring functions.	Cost shared among participants.	Safe, reliable and cost-effective interconnection solutions, and user friendly for the end user. Power quality and grid monitoring.	On going.	Unknown	Ted Bronson

Summary of Non-National Lab Testing

- Manufacturer product development tests (proprietary, not included in matrix)
- Most tests focus on very specific issues, limited test time
- A few multiple device tests ongoing
- University testing
  - Some large scale (UCI has several micro-generation units)
  - Laboratory scale research tests
- Range of testing being conducted by users, utilities and co-ops
  - Most tests to gain familiarity with equipment
  - Several utilities and co-ops conducting in depth testing
- Limited publication of test results

Testing Goals

- Demonstrate basic performance parameters
  - Establish confidence in functionality on the part of end users (They will work)
- Demonstrate operation in a “good neighbor mode” (Be acceptable to utilities)
  - Connect compatibly to the grid
  - Disconnect from grid in outage (not backfeed)
  - Parallel with other DG sources (hybrid/micro-grid)
  - Improve grid power quality
- Meet emissions requirements
- Demonstrate integration with CHP and facility thermal loads
- Certify for safety and performance
- Test new and innovative technologies and concepts
- Provide data for economic analyses (efficiency, O&M, etc.)

Results must be accessible and understandable to all potential users

Gaps and Needs

- Need a central collection point of testing activities that is updated regularly to help people locate testing facilities and test results
  - Categorized
  - Searchable
- Need standards for testing
  - IEEE P1547, P1589 and UL 1741 will clarify and unify testing requirements and procedures
  - Allow regulators, permitters, utility interconnection personnel and users to identify qualified devices and procedures
- Need ‘typical’ applications testing to help users understand available options and the associated benefits
- Need testing supporting long term goals
  - High penetration
  - Reliability (Ancillary) services

Additional Testing Needs

- Interconnection – work is starting on individual units
  - Aggregation of multiple units
  - Aggregation of different types of generators
  - Network interaction
- System integration with storage devices
- Microgrid – Very little testing being done
- Power Electronic Interface – Test for microgrid support capability, such as voltage and frequency regulation, reactive power supply, islanding, etc.
- Reliability – Few long term reliability tests being conducted at either component or system level
- Protection – Interaction of DER with common utility protection equipment, especially to meet long term goals
- Communication and control interface